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Input Price Risk and the Adoption of Conservation Technology

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CORNHUSKER ECONOMICS

University of Nebraska–Lincoln Extension

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Institute of Agriculture & Natural Resources
Department of Agricultural Economics
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Input Price Risk and the Adoption of Conservation Technology

Market Report	Yr Ago	4 Wks Ago	10/1/10
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight	$81.52	$96.62	96.48
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	105.77	128.65	123.51
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	99.83	116.29	110.07
Choice Boxed Beef, 600-750 lb. Carcass	137.25	163.12	156.27
Western Corn Belt Base Hog Price Carcass, Negotiated	48.72	78.13	76.64
Feeder Pigs, National Direct 50 lbs, FOB	*	*	*
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	53.99	91.78	88.43
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct	94.12	141.75	142.12
National Carcass Lamb Cutout, FOB	249.66	310.45	329.95
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	3.43	5.85	5.20
Corn, No. 2, Yellow Omaha, bu.	3.22	4.10	4.11
Soybeans, No. 1, Yellow Omaha, bu.	8.56	10.25	10.05
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	4.89	7.27	7.25
Oats, No. 2, Heavy Minneapolis, MN , bu.	2.05	2.93	3.28
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	*	135.00	*
Alfalfa, Large Rounds, Good Platte Valley, ton.	82.50	72.50	*
Grass Hay, Large Rounds, Premium Nebraska, ton.	*	*	75.00
Dried Distillers Grains, 10% Moisture, Nebraska Average.	93.00	115.50	127.50
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	36.12	37.00	47.00

***No Market**

Energy price trends have shown increases in both the mean and variance in recent years. In addition, innovation activity continues to develop new technologies that can benefit consumers by providing the same services as traditional technology, but with higher input use efficiency. For example, technologies such as hybrid vehicles or compact fluorescent light bulbs provide consumers with benefits, while simultaneously reducing the demand for limited energy inputs. Examining the impact of increasing price variability on the adoption of conservation technologies is important to innovators and policy-makers. This is especially important when multiple technologies exist, and producers have an option to buy conservation technology that can reduce use of limited natural resources.

The trend in real diesel prices between 1980 and 2009 are shown in Figure 1 (on next page). Two things stand out from this chart: the real price of diesel has increased in the last decade, and; the variation in this price is much larger in the last five years than in the earlier period.

In addition to changes in the market price for an input, there is also variation in a firm's access to fixed price contracts. For example, small firms may have to purchase fuel inputs at market prices while large firms can develop a contract with a supplier that allows them to purchase fuel inputs at a fixed price. The risk that faces firms with an uncertain price affects their production and input choices. Making no assumptions about risk aversion, how input price risk affects a firm's choice of output and technology is looked at.

As conservation technology is generally more expensive, the decision to adopt depends on whether firms expect the future cost-savings from reduced input

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use to sufficiently compensate for higher investment costs. It turns out that in some cases input price risk will lead to higher adoption rates of conservation technology, while in other cases it will reduce adoption rates. This decision is affected by several factors: the probability that the firm chooses to operate under high input prices, and the cost savings achieved from the conservation technology. This has implications for programs that try to stabilize prices. An example of such a program is a recent offer from Black Hills Energy to provide natural gas to residential customers at a fixed rate for the November 2010 – October 2011 period. Such a program may actually reduce the probability that the firm or household chooses to adopt energy-efficient technologies that could reduce its demand for energy.

Using an economic model of production choices and input use, there are two primary results. *First*, when input prices are risky, having conservation technology allows a producer to operate under a larger range of prices. *Second*, when everyone has the same type of technology, shut-down rates will be lower under fixed input prices.

To estimate these impacts, data on field level irrigation practices was used. The data comes from an irrigation district in Southern California, and includes a wide variety of crops and irrigation systems. The region has a warm enough climate to allow for two cropping seasons each year. There are two groups of irrigators in the sample – groundwater users who need to pay their own pumping costs, and surface water users who pay the irrigation district for water deliveries. The rate that groundwater users pay for irrigation varies depending on fuel costs, while the price that surface water users pay is set at the beginning of the year. The two results from the economic model are confirmed. First, groundwater users (those with input price risk) are 12.6 percent less likely to plant two crops a year if they have conventional furrow irrigation (as opposed to drip or sprinkler irrigation). Second, surface water users (who have fixed input prices) are 7.4 percent less likely to fallow a field for the second planting season of the year.

In this sample of irrigators, it is found that the average effect of moving from stochastic input prices to fixed input prices is a 3.9 percent increase in the probability of adopting conservation irrigation. While the numerical results will vary depending on the resource, its use and the available technologies, these results do show that even when average prices are the same, price variability makes a difference in production and technology choices, and has implications for natural resource use levels.

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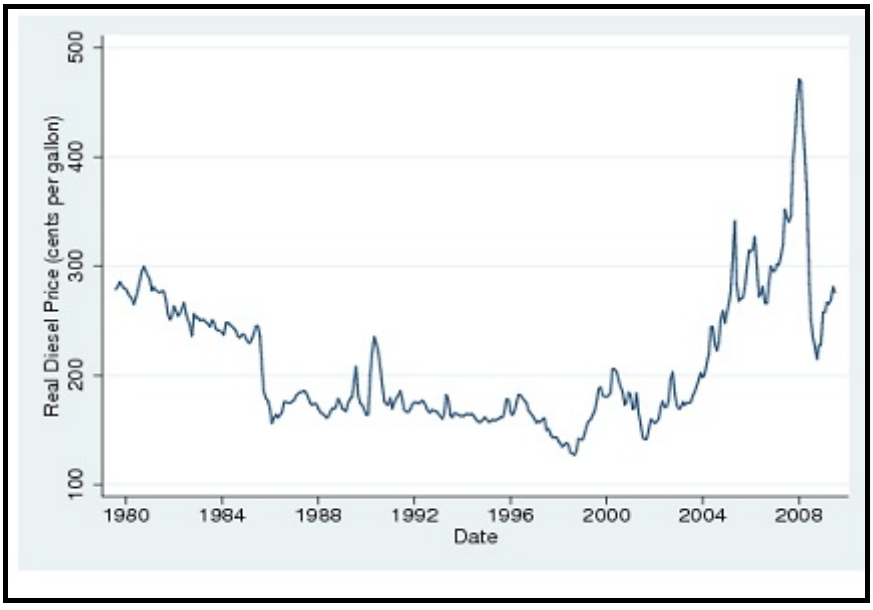

Figure 1: Cents per Gallon for Diesel

Source: Energy Information Administration